

Date: Wednesday, 7/5/2006 2:43:05 PM  
 User: Kim Johnston

## Process Sheet

<b>Customer</b> : CU-DAR001 Dart Helicopters Services	<b>Drawing Name</b> : 350/355 AS X-TUBE AFT
<b>Job Number</b> : 27827	
<b>Estimate Number</b> : 12486	
<b>P.O. Number</b> : <i>N/A</i>	<b>Part Number</b> : D350748201
<b>This Issue</b> : 7/5/2006 <b>S.O. No.</b> : <i>N/A</i>	<b>Drawing Number</b> : IIN D350-748 P5 PREL <i>906.07.05</i>
<b>Prsht Rev.</b> : NC	<b>Project Number</b> : N/A
<b>First Issue</b> : <i>N/A</i> <b>Type</b> : LANDING GEAR	<b>Drawing Revision</b> : PREL
<b>Previous Run</b> :	<b>Material</b> : <i>N/A</i>
<b>Written By</b> : <i>[Signature]</i>	<b>Due Date</b> : 7/30/2006 <b>Qty:</b> 1 <b>Um:</b> Each
<b>Checked &amp; Approved By</b> : <i>[Signature]</i>	
<b>Comment</b> : Est Rev: A New Issue 06-07-05 JLM	

## Additional Product

Job Number:



<b>Seq. #:</b>	<b>Machine Or Operation:</b>	<b>Description :</b>
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1.0	DC	DOCUMENT CONTROL
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①

<b>Comment:</b> Photocopy bluefile & type labels per PPPD350-748-201	CHG001
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*K-9 06-10-02*

2.0	27827A	X-TUBE AS 350/355 HI AFT
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<b>Comment:</b> Sub-Component X-TUBE AS 350/355 HI AFT
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3.0	PACKAGING 1	PACKAGING RESOURCE #1
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<b>Comment:</b> PACKAGING RESOURCE #1
Pick Packing Kit

4.0	D35001	350 SADDLE
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<b>Comment:</b> Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)
350 SADDLE
Batch: <i>B28096</i>

5.0	D35011	BUSHING
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<b>Comment:</b> Qty.: 16.0000 Each(s)/Unit Total : 16.0000 Each(s)
BUSHING
Batch: <i>B28127</i>

6.0	AN46A	Bolt
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<b>Comment:</b> Qty.: 16.0000 Each(s)/Unit Total : 16.0000 Each(s)
Bolt
Batch: <i>M101418</i>

*PB 06/09/20*

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design Mgr	Approval QC Inspector

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: Date & initial all entries

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

Date: Wednesday, 7/5/2006 2:43:05 PM  
User: Kim Johnston

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: 350/355 AS X-TUBE AFT

Job Number: 27827

Part Number: D350748201

Job Number:



Seq. #:

Machine Or Operation:

Description :

7.0

AN441A

bolt



Comment: Qty.: 8.0000 Each(s)/Unit Total : 8.0000 Each(s)

bolt

Batch: M101538

8.0

AN532A

Bolt



Comment: Qty.: 4.0000 Each(s)/Unit Total : 4.0000 Each(s)

Bolt

Batch: M101648

9.0

AN960JD416

Washer



Comment: Qty.: 32.0000 Each(s)/Unit Total : 32.0000 Each(s)

Washer

Batch: M19185

10.0

AN960JD516

Washer



Comment: Qty.: 8.0000 Each(s)/Unit Total : 8.0000 Each(s)

Washer

Batch: M101369

11.0

MS21042L4

Nut



Comment: Qty.: 24.0000 Each(s)/Unit Total : 24.0000 Each(s)

Nut

Batch: M19099

12.0

MS21042L5

Nut



Comment: Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s)

Nut

Batch: M101648

LB 06/09/28

13.0

QC4

INSPECT 100% KITS FOR COMPLETENESS



Comment: INSPECT 100% KITS FOR COMPLETENESS

106/10/03 (1)

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design Mgr	Approval QC Inspector

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: Date & initial all entries

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

Date: Wednesday, 7/5/2006 2:43:05 PM  
User: Kim Johnston

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: 350/355 AS X-TUBE AFT

Job Number: 27827

Part Number: D350748201

Job Number:



Seq. #:

Machine Or Operation:

Description :

14.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and pack for shipping as per PPP D350-748-201

Location:

PPP Rev:

*Draft*

*2306/11/07 ①*

15.0

DC

DOCUMENT CONTROL



Comment: DOCUMENT CONTROL

Inspection Level 21

*2306/11/08*

Job Completion



*2306/11/08*

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design Mgr	Approval QC Inspector

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: Date & initial all entries

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

3.10 Apply a continuous bead of Sikaflex-241/-291 or Proseal 890 or MIL-S-8802 Class B2 sealant in the following locations as per Figure 6:

- A) Along saddle/crosstube interface.
- B) Between the saddle flanges.
- C) Along saddle/skidtube interface.

#### 4.0 WEIGHT AND BALANCE

The following weight and balance information is for Dart crosstube installations only. This data should be similar to the existing installation. Differences from the parts removed are the responsibility of the installer.

DART CROSSTUBE	FWD/AFT	WEIGHT	STA	MOMENT
D350-748-101	Fwd	35.2 lb (16.0 kg)	106.3 in (2.70 m)	3742 lb-in (43.2 kg-m)
D350-748-201	Aft	34.7 lb (15.7 kg)	162.4 in (4.12 m)	5635 lb-in (64.7 kg-m)

#### 5.0 PARTS LIST

Qty -101	Qty -201	Part Number	Description
X		D350-748-101	CROSSTUBE INSTALLATION, AS 350/355 HIGH FWD
	X	D350-748-201	CROSSTUBE INSTALLATION, AS 350/355 HIGH AFT
1		D350-748-141	CROSSTUBE ASSEMBLY, AS 350/355 HIGH FWD
	1	D350-748-241	CROSSTUBE ASSEMBLY, AS 350/355 HIGH AFT
*2	*2	D3502-1	SUPPORT
*2	*2	D2856-400-710	ABRASION STRIP
*1	*1	AELS-1032-225	INSERT
*2	*2	MS21920-20	CLAMP
*1	*1	MS27039-1-10	SCREW
*1	*1	AN960JD10	WASHER
4	4	D3500-1	SADDLE
16	16	D3501-1	BUSHING
16	16	AN4-6A	BOLT
8	8	AN4-41A	BOLT
4	4	AN5-32A	BOLT
32	32	AN960JD416	WASHER
8	8	AN960JD516	WASHER
24	24	MS21042L4	NUT (OR MS21042-4)
4	4	MS21042L5	NUT (OR MS21042-5)

\* REFERENCE ONLY. PARTS ARE INCLUDED IN D350-748-141/241 ASSEMBLIES ABOVE

SHOP COPY  
RETURN TO  
ENGINEERING

UNCONTROLLED COPY  
SUBJECT TO AMENDMENT

WITHOUT NOTICE

WORK ORDER

NO 27827

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Revision: A

Date: 06.05.08

Date: Wednesday, 7/5/2006 2:43:20 PM  
 User: Kim Johnston

## Process Sheet

Customer	: CU-DAR001 Dart Helicopters Services	Drawing Name	: X-TUBE AS 350/355 HI AFT
Job Number	: 27827A	Part Number	: D350748241
Estimate Number	: 12483	Drawing Number	: D350-748-241:PREL
P.O. Number	: <i>N/A</i>	Project Number	: N/A
This Issue	: 7/5/2006 S.O. No. : <i>N/A</i>	Drawing Revision	: PREL
Prsht Rev.	: NC	Material	: <i>N/A</i>
First Issue	: <i>N/A</i> Type : LANDING GEAR	Due Date	: 7/30/2006
Previous Run	: <i>N/A</i>	Qty:	1 Um: Each
Written By	: <i>[Signature]</i>		
Checked & Approved By	: <i>[Signature]</i> 06.07.05		
Comment	: Est Rev A New Issue 06-07-05 JLM		

## Additional Product

Job Number:



Seq. #:	Machine Or Operation:	Description :
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1.0	DC	DOCUMENT CONTROL
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Comment: DOCUMENT CONTROL

Photocopy bluefile and create labels as per PPP D350-748-241 CHG001

*N/A*

2.0	D6018125	Crosstube Material
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Comment: Qty.: 1.0000 Each(s)/Unit Total : 1.0000 Each(s)

Crosstube Material

D6018-125

2.299" OD X 2.000" ID

Batch: *1327318**ML 06/07/13*

3.0	MORI SEIKI	MORI SEIKI CNC LATHE LARGE
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Comment: MORI SEIKI CNC LATHE LARGE

1-Fill tube with sand & install plugs DT *N/A* on both ends as per Folio FA647

2-Turn first side as per Folio FA647

3-Deburr &amp; Inspect for surface damage. Repair damage within limits as per Dwg D350-748-241.

*ML 06/07/13*

4.0	QC1	INSPECT ALL DIM TO DIM SHEET
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Comment: INSPECT ALL DIM TO DIM SHEET

*ML 06/07/13*



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design Mgr	Approval QC Inspector

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			
06.08.17	3	Some dimensions of OD do not match dwg	UP 06.08.17 per QSI 042	PART IS OK PER ATTACHED DS EMAIL	06/07/13	06.11.09	UP 06.08.17 per QSI 042	06.11.09

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes ☐ No ☒ DQA: LD Date: 06/11/09

NOTE: Date &amp; initial all entries

QA: N/C Closed: \_\_\_\_\_

Date: \_\_\_\_\_

Date: Wednesday, 7/5/2006 2:43:20 PM  
User: Kim Johnston

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: X-TUBE AS 350/355 HI AFT

Job Number: 27827A

Part Number: D350748241

Job Number:



Seq. #:

Machine Or Operation:

Description:

5.0

MORI SEIKI

MORI SEIKI CNC LATHE LARGE



Comment: MORI SEIKI CNC LATHE LARGE

1-Turn second side as per Folio FA647

*ML 06/07/13*

2-Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D350-748-241.

6.0

QC1

INSPECT ALL DIM TO DIM SHEET



Comment: INSPECT ALL DIM TO DIM SHEET

*ML 06/07/13*

7.0

QC8

SECOND CHECK



Comment: SECOND CHECK

*BG 06-07-16*

8.0

OUTSIDE SERVICE

OUTSIDE SERVICES



Comment: Sub-Contracting OUTSIDE SERVICES

Issue P/O: *1709*

Heat Treat to min 180 KSI As per Dwg D350-748-241

Sand Blast tube after Heat Treat

Possible Supplier: Vac Aero

Ensure Certificate of Conformity is attached

*u 06-07-18*

9.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Receive & Inspect For Transit Damage

Ensure certificate of conformity is attached

*PD 06/07/13 10 ①*

10.0

QC6

DIMENSIONAL CHECK



Comment: DIMENSIONAL CHECK

*Doc 09-06*



11.0

BENDING

BENDING MACHINE



Comment: BENDING MACHINE

Bend tube as per Dwg D350-748-241 using CNC bender program \_\_\_\_\_ and Folio FT \_\_\_\_\_

*11.1 QC 6 dimensional check*

*06-08-07*  
*PD*

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design Mgr	Approval QC Inspector	
06-08-09	11	QCG dim check, before drilling. Perm. Change				<i>[Signature]</i> 06-08-09	<i>[Signature]</i> 06-08-09	
06.10.03	14	CAD plate and Magnetic Particle Inspect per dwg D30-748-14) RevC. Acceptable to CAD plate to spec AMS-QQ-P-416B				<i>[Signature]</i> 06-10-03	<i>[Signature]</i> 06-11-03	

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: Date &amp; initial all entries

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

Date: Wednesday, 7/5/2006 2:43:21 PM  
User: Kim Johnston

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: X-TUBE AS 350/355 HI AFT

Job Number: 27827A

Part Number: D350748241

Job Number:



Seq. #:

Machine Or Operation:

Description :

12.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Remove all marks from tube within limits of D350-748-241

DPG-8-23

2-Drill Tube as per Dwg D350-748-241

DPG-8-25

3-Deburr

4-Engrave Part # and Batch # as per Dwg D350-748-241

Done at Seq. #5

13.0

QC6

DIMENSIONAL CHECK



Comment: DIMENSIONAL CHECK

Done at Seq. #11

06.01.07  
06.07.09

14.0

OUTSIDE SERVICE

OUTSIDE SERVICES



Comment: Sub-Contracting OUTSIDE SERVICES

Liquid Penetrant Inspection as per QSI 038

Issue P/O: 2000

LPI as per ASTM 1417 Level 2

Attach copy of NDT results to work order

C 2061091.11 ①

# See deviation

15.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Inspect for transit damage Ensure copy of NDT results attached to work order.

06.02.28

16.0

QC6

DIMENSIONAL CHECK



Comment: Inspect for damage & ensure results are as per Dwg D350-748-241

206.05.28 ①

17.0

SPRAY PAINTING

SPRAY PAINTING



Comment: SPRAY PAINTING

1-Prime inside crosstube as per QSI 005 4.2

PRIME OUTSIDE OF CROSSTUBE PER QSI 005 4.2

06.04.29 ①

06.04.29 ①

06.04.25

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design Mgr	Approval QC Inspector
06.09.25	17 19	PRIME INSIDE & OUTSIDE OF TUBE THEN PAINT PER COS 005 4.2 per D350-748-24) Rev C				CP 06.09.25 PC 451642	16.10.13

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: Date &amp; initial all entries

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

Date: Wednesday, 7/5/2006 2:43:21 PM  
User: Kim Johnston

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: X-TUBE AS 350/355 HI AFT

Job Number: 27827A

Part Number: D350748241

Job Number:



Seq. #:

Machine Or Operation:

Description :

18.0

QC14

Inspect Spray Paint



Comment: Inspect Spray Paint

Then, Wrap in plastic bag to protect from scratches

N/A

19.0

POWDER COATING

POWDER COATING



Comment: POWDER COATING

PAINT OUTSIDE OF CRUSTUBE PER QSI 005 4.2

Powder Coat White Gloss (Ref: 4.3.5.1) as per QSI 005 4.3

ML 06 09 29 (1)

CP 06.09.25

20.0

QC14

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

PAINT

CP 06.09.25

06.10.30

21.0

D35021

SUPPORT



Comment: Qty.: 2.0000 Each(s)/Unit Total: 2.0000 Each(s)

SUPPORT

Batch: 027874

IT 06 10 31

22.0

D2856400

Abrasion Strip



Comment: Qty.: 1.2401 f(s)/Unit Total: 1.2401 f(s)

Abrasion Strip 7.10" long x2

Batch: 028258

IT 06 10 31

23.0

ALS41032225

Insert



Comment: Qty.: 1.0000 Each(s)/Unit Total: 1.0000 Each(s)

Insert

Batch: 119393

IT 06 10 31

24.0

AN960JD10

Washer



Comment: Qty.: 1.0000 Each(s)/Unit Total: 1.0000 Each(s)

Washer

Batch: 100743

IT 06 10 31

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design Mgr	Approval QC Inspector

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: Date & initial all entries

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

Date: Wednesday, 7/5/2006 2:43:21 PM  
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## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: X-TUBE AS 350/355 HI AFT

Job Number: 27827A

Part Number: D350748241

Job Number:



Seq. #:

Machine Or Operation:

Description :

25.0

MS2192020

Clamp (per MIL-DTL-8783C)



Comment: Qty.: 2.0000 Each(s)/Unit Total: 2.0000 Each(s)

Clamp (per MIL-DTL-8783C)

Batch: M102440

IT 06-10-31

26.0

MS35206344

MS27039-1-10 Screw



Comment: Qty.: 1.0000 Each(s)/Unit Total: 1.0000 Each(s)

Screw

Batch: 18836

IT 06-10-31

27.0

LANDING GEAR 1

LANDING GEAR RESOURCE 1



Comment: LANDING GEAR RESOURCE 1

1-Install Ground wire Insert, then insert screw and washer

2-Install Abrasion strips as per Dwg D350-748-241 & QSI 035.

2-A. Sprink LPS 3 inside tube M101915

3-Install supports as per Dwg D350-748-241, Torque to 60-80 IN-LBS

IT 06-10-31 ①

a.m 06/11/03 ①

PTC

28.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

06/11/03 ①

29.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and pack for shipping as per PPP D350-748-241

Location: \_\_\_\_\_

PPP Rev: \_\_\_\_\_

N/A

30.0

DC

DOCUMENT CONTROL



Comment: DOCUMENT CONTROL

Inspection Level 21

Job Completion

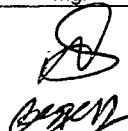
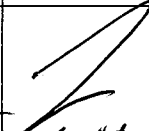


POSITIVE RECALL

EFFECTIVE 06/09/06 AUTH 108

RELEASED 108 DATE 06/09/06



W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design Mgr	Approval QC Inspector	
06-11-03	27	Spray inside of x-tube with LPS 3. Add to Dwg's Estimate. After assembly - in F.P. cell perm. change					 06-11-03	

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: Date & initial all entries

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

**PRELIMINARY ISSUE**

DESIGN <b>90</b>	DRAWN BY	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
CHECKED	APPROVED	DRAWING NO. <b>D350-748-241</b>	REV. B SHEET 1 OF 3
DATE <b>06.06.30</b>		TITLE <b>CROSSTUBE (AS 350/355 HI AFT)</b> SCALE NTS	
A	<b>06.03.31</b>	<b>NEW ISSUE</b>	
B	<b>06.06.30</b>	<b>ADD D6018-125 &amp; PRIME AND PAINT</b>	

QTY	P/N	DESCRIPTION
X	D350-748-241	CROSSTUBE ASSEMBLY (AS 350/355 HI AFT)
1	D6018-125	CROSSTUBE (OR D6015-125)
2	D3502-1	SUPPORT
2	D2856-400-710	ABRASION STRIP
1	AELS-1032-225	INSERT
1	AN960JD10	WASHER
2	MS21920-20	CLAMP
1	MS35206-344	SCREW

*NEW Rev.*

**D350-748-141 CROSSTUBE:**

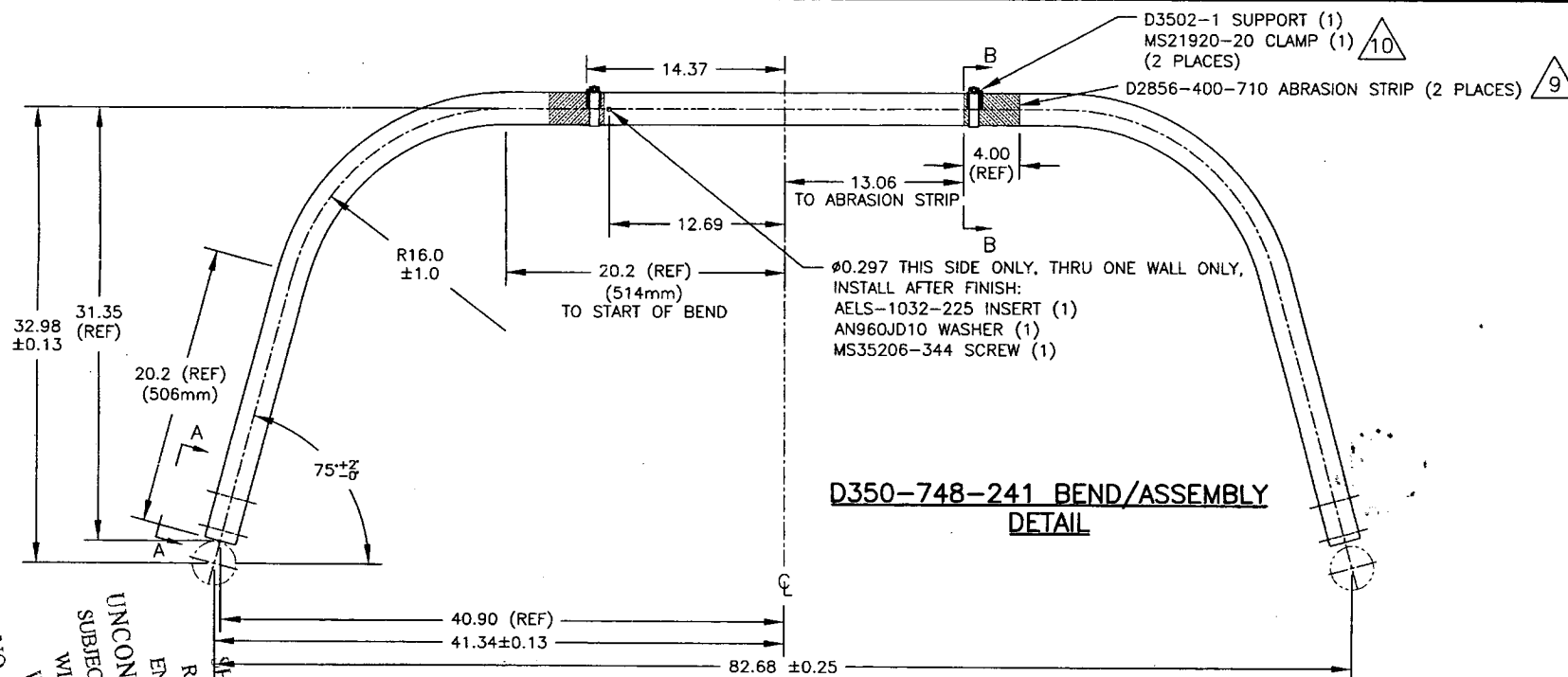
- MATERIAL: MANUFACTURED FROM D6018-125 OR D6015-125  
FINISHED LENGTH = 122.70±0.06
- MACHINE PER MACHINING DETAIL ON PAGE 3. BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITIONS SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING STYLUS.
- BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 AFTER TURNING
- LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- FINISH: POWDER COAT WHITE (4.3.5.2) OUTSIDE PER DART QSI 005 4.3.  
PRIME INSIDE PER DART QSI 005 4.2.  
OR  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- INSTALL D2856-400-710 ABRASION STRIP WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- TORQUE MS21920-20 CLAMPS 60 TO 80 IN-LB
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS ARE IN INCHES
- PART IS SYMMETRIC ABOUT CENTERLINE EXCEPT FOR Ø0.297 HOLE.

NO COPY  
RETURN TO  
ENGINEERING  
UNLESS  
SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. **278 27A**

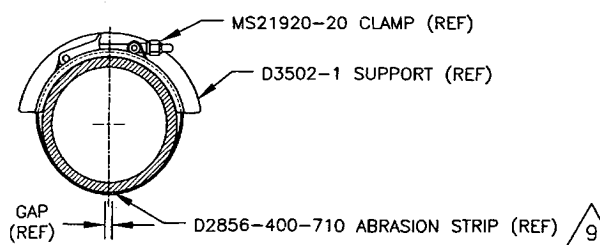
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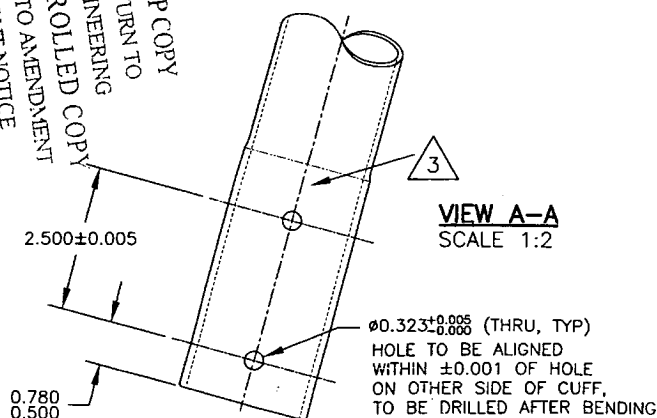
PRELIMINARY ISSUE



**SECTION B-B**  
SCALE 1:2

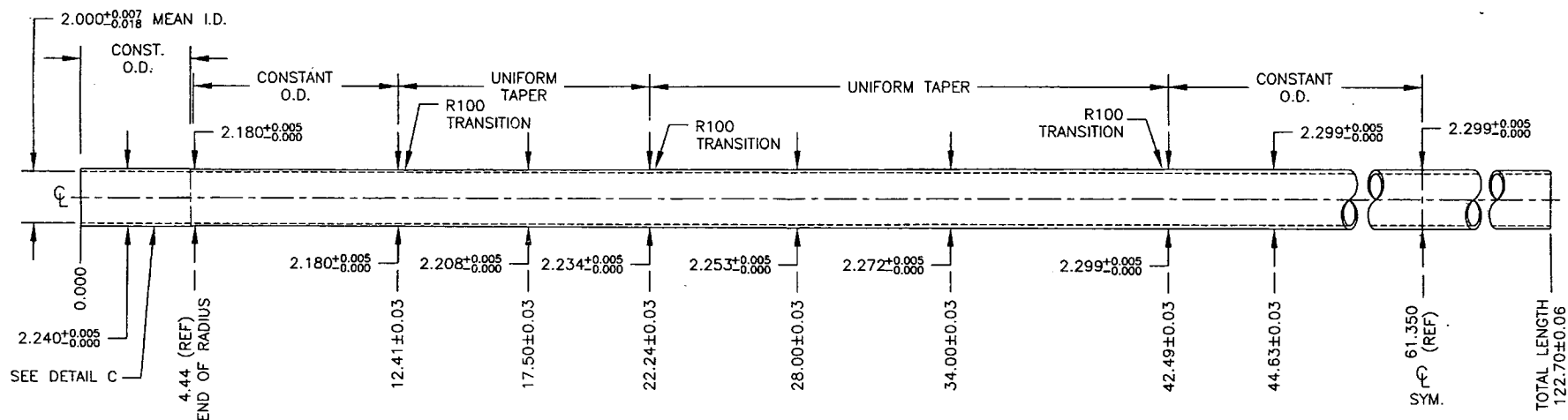


**VIEW A-A**  
SCALE 1:2



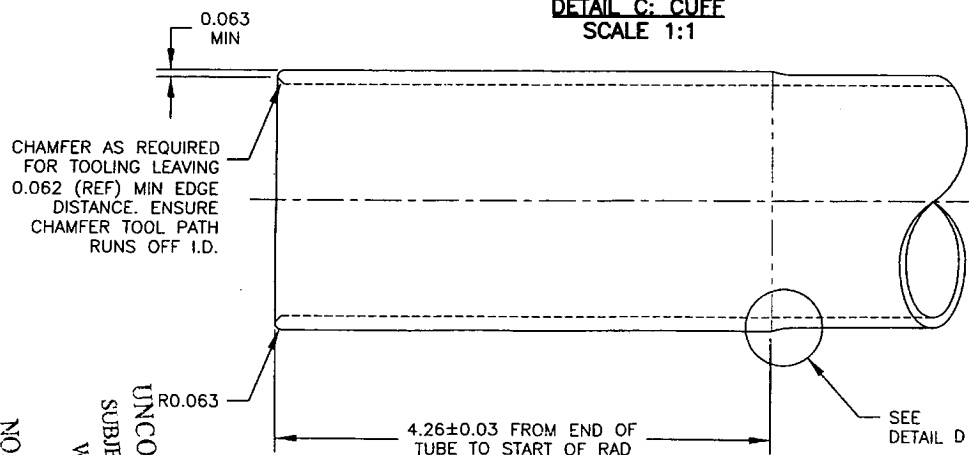
WORK ORDER  
NO. 28271A  
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COPYRIGHT © 2006 BY DART AEROSPACE LTD.		DESIGN <span style="border: 1px solid black; padding: 2px;">97</span>	DRAWN BY	<b>DART</b> DART AEROSPACE LTD. WARRICKSURY, OXFORDS, CANADA
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		DATE 06.06.30		TITLE CROSSTUBE (AS 350/355 HI AFT)
				REV. B SHEET 2 OF 3 SCALE 1:8

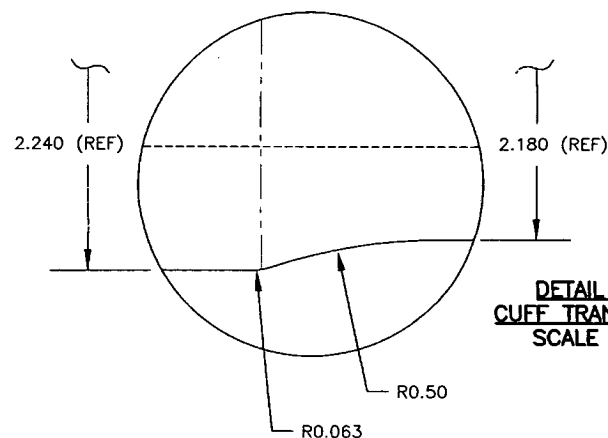


**D350-748-241 MACHINING DETAIL**

**DETAIL C: CUFF  
SCALE 1:1**



**DETAIL D: CUFF TRANSITION  
SCALE 9:1**



NO. 27827A  
WORK ORDER  
WITHOUT NOTICE  
SUBJECT TO AMENDMENT  
UNCONTROLLED COPY  
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SHOP COPY

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DATE 06.06.30		TITLE CROSSTUBE (AS 350/355 HI AFT)			SCALE 1:4

PRELIMINARY ISSUE

<b>DART AEROSPACE LTD</b>		<b>Work Order:</b> 27827A
<b>Description:</b> X-Tube AS 350/355 HI AFT		<b>Part Number:</b> D350748241
<b>Inspection Dwg:</b>	<b>Rev:</b>	Page 1 of 1

### FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☒ Prototype

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
2.240	+ .005 - .000	2.241	✓			✓
2.180	"	2.184	✓			✓
2.180	"	2.185	✓			+0.006"
2.208	"	2.213	✓			+0.006"
2.234	"	2.239	✓			✓
2.253	"	2.258	✓			+0.007"
2.272	"	2.276	✓			✓
2.299	"	2.299	✓			-0.004"
2.299	"	2.301	✓			✓
.063	"	0.063	✓			
4.26	±0.030	4.275	✓			Centre 2.299 is -0.003"
12.70	± .060	12.720	✓			
2.240	+ .005 - .000	2.241	✓			✓
2.180	"	2.184	✓			✓
2.180	"	2.185	✓			+0.013"
2.208	"	2.213	✓			+0.012"
2.234	"	2.239	✓			+0.014"
2.253	"	2.258	✓			+0.015"
2.272	"	2.277	✓			✓
2.299	"	2.300	✓			✓
2.299	"	2.303	✓			✓
.063	"	0.063	✓			
4.26	± .030	4.263	✓			

<b>Measured by:</b> JML	<b>Audited by:</b> BG	<b>Prototype Approval:</b> CP
<b>Date:</b> 06/07/13	<b>Date:</b> 06-07-16	<b>Date:</b> 06.07.17

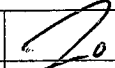

Rev	Date	Change	Revised by	Approved
A		New Issue	KJ/JLM	

DART AEROSPACE LTD		Work Order: 278 274
Description: 350 X-Tube Hi Alt		Part Number: D350-748-241
Inspection Dwg:	Rev: Prel.	Page 1 of 1

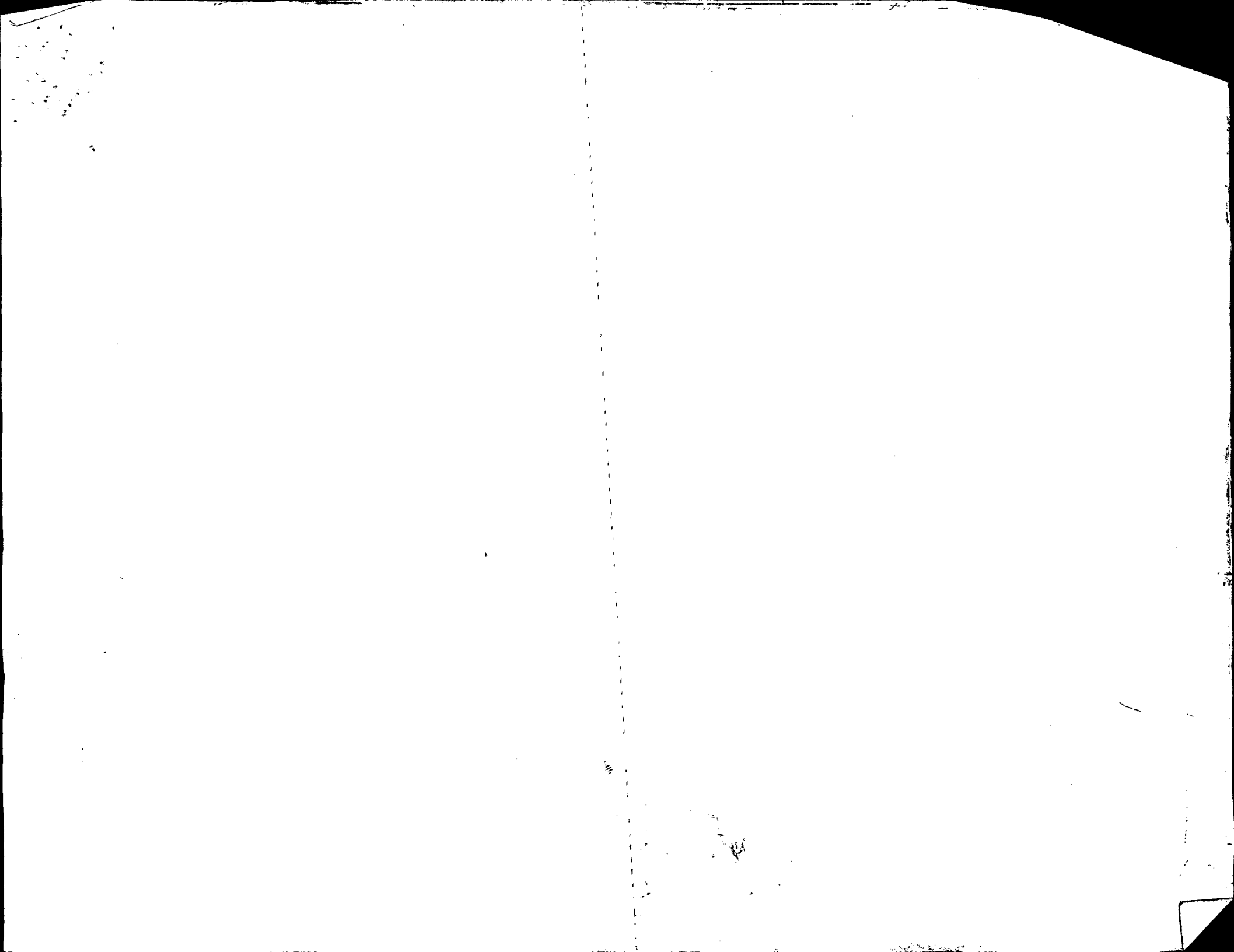
### FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☒ Prototype

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
Point 1	MIN 0.100"	a) .124				
① 28.00" length		b) .116				
		c) .122				
		d) .127				
Point 2	MIN 0.130"	a) .131				
① 61.30 length		b) .133				
		c) .135				
		d) .132				
Point 3	MIN 0.100"	a) .128				
① 28.00" length		b) .130				
<del>Point 3</del>		c) .107				
		d) .101				
ID 2.000	$\begin{matrix} +0.007 \\ -0.018 \end{matrix}$	2.003			VERN	
	$\begin{matrix} +0.007 \\ -0.018 \end{matrix}$	2.003			VERN	
	$+0.007/-0.018$				CALC	
	$+0.007/-0.018$				CALC	
	$+0.007/-0.018$				CALC	

Measured by: 	Audited by: 	Prototype Approval:
Date: 06.07.17	Date: 06.07.18	Date:

Rev	Date	Change	Revised by	Approved
A		New Issue	KJ/JLM	





**VAC AERO**  
INTERNATIONAL INC.

284

**PACKING SLIP**

OAK 77605-1

07/28/2006

MM/DD/YYYY

PAGE: 1



HEAD OFFICE  
1371 SPEERS ROAD, OAKVILLE, ONTARIO  
CANADA L6L 2X5  
TEL: (905) 827-4171 FAX: (905) 827-7489



QUEBEC DIVISION  
7450 RUE VÉRITÉ STREET, ST. LAURENT, QUÉBEC  
CANADA H4S 1C5  
TEL: (514) 334-4240 FAX: (514) 334-6269

GST No.: R105468102

1DAR01

BILL TO: DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

SHIP TO: DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

K6A 1K7

K6A 1K7

DATE SHIPPED	SHIP VIA	F.O.B.
07/28/2006		ORIGIN
CUSTOMER P/O No.	JOB No.	TERMS
1709		COD

LN	PART NO	DESCRIPTION	UOM	QTY ORDERED	QTY SHIPPED	B/O QTY
01	D350-CROSS TUBES		EA	8	8	0
		Process Specifications: Procedure: 4353 HEAT TREATED TO 180-200 KSI PER AMS 2759-1C MATERIAL: 4130				
		D350-748-141 B27823A, B27824A, B27825A, B27826A D350-748-241 B27830A, B27829A, B27827A, B27828A				
		NOTE: SAND BLAST TUBES				
02	LC	LOT CHARGE 320LBS X \$2.26/LB		1	1	0

No claims for shortage in weight or count will be entertained, unless presented within 5 working days after receipt of materials by customer.

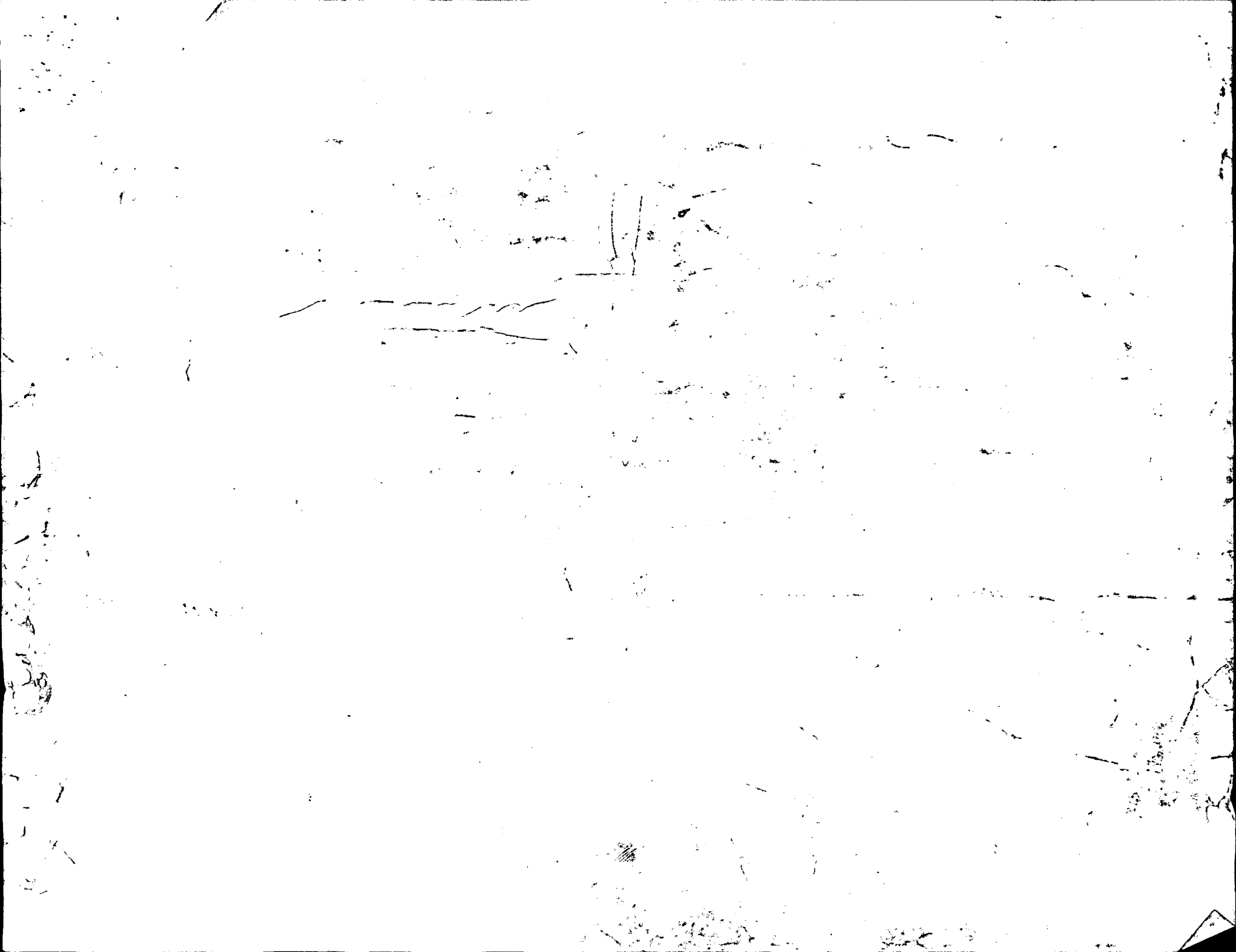


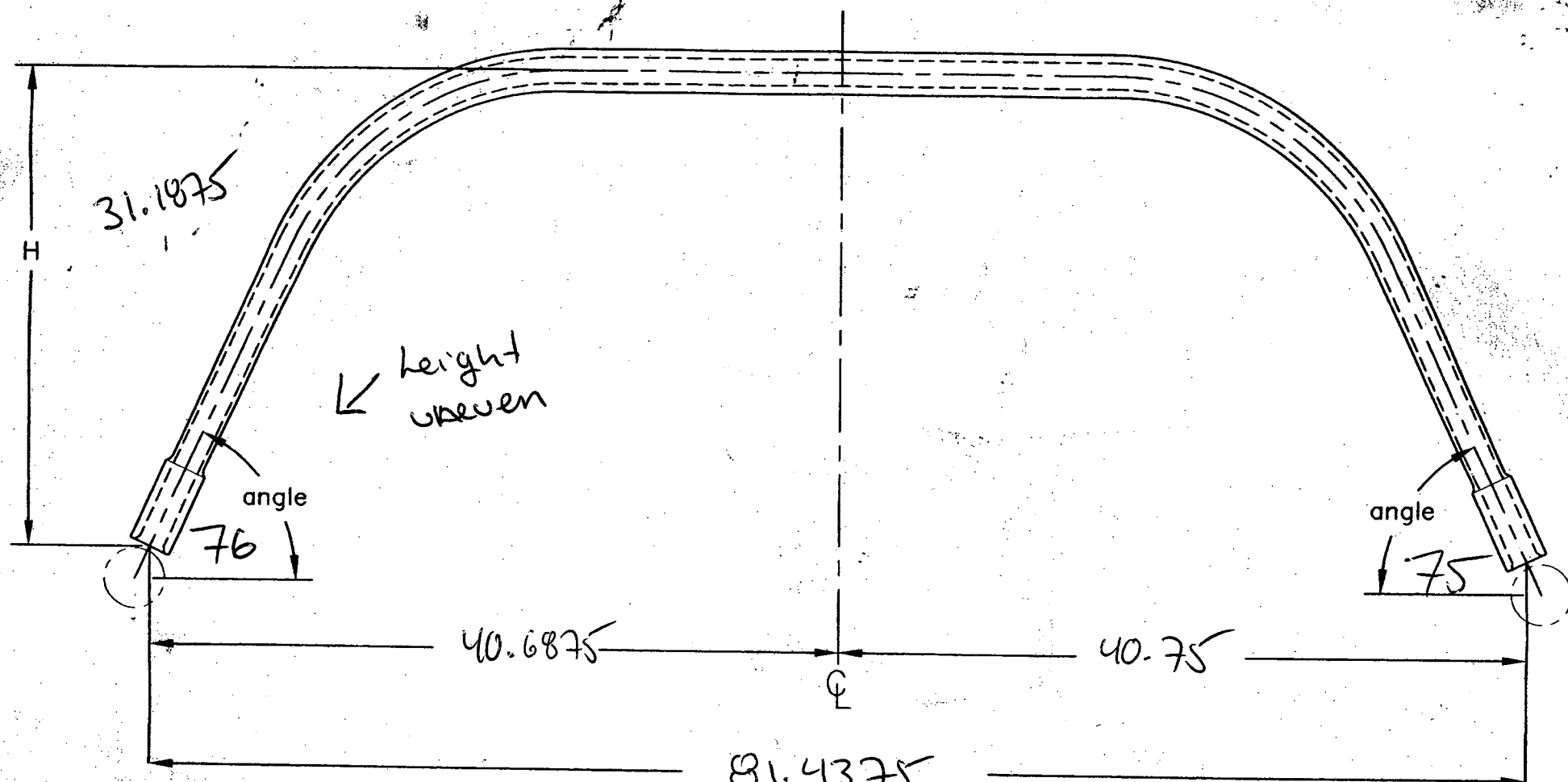
VACUUM BRAZING · HEAT TREATING · SPECIAL PROCESSING · FURNACE EQUIPMENT



HEAT







DATE: 06-08-09

DESCRIPTION: 350-748-241

BATCH NO: B27827A

DRAWING: 350 prelim Rev B

H: 31.35 ~~8~~

1/2 SPAN: 40.90 ± .130

TOTAL SPAN: 81.8

ANGLE: 75 ± 3

*[Signature]*  
060907

**Chris Provencal**

**From:** S Shahbazian [sshahbazian@dartaero.com]  
**Sent:** August 17, 2006 12:18 PM  
**To:** Provencal, Chris  
**Subject:** FW: 350 aft Xtube OD variations

Please verify see if B27829A can be salvaged.

Serge Shahbazian  
Design Manager  
Dart Aerospace Ltd.  
Tel: 613-632-3336

-----Original Message-----

From: David Shepherd [mailto:dshepherd@dartaero.com]  
Sent: August 17, 2006 12:13 PM  
To: 'S Shahbazian'  
Cc: 'Dan Stow'; 'L Lacelle'  
Subject: RE: 350 aft Xtube OD variations

D350-748-241 B27827A, B27828A, and B27830A are acceptable to me.

D350-748-241 B27829A is unacceptable to me at this point.  
If you want to try to salvage it, I think we should look at the ID and calculate some inertias for comparison.

David

-----Original Message-----

From: S Shahbazian [mailto:sshahbazian@dartaero.com]  
Sent: Tuesday, August 08, 2006 6:47 AM  
To: Shepherd, David  
Subject: FW: 350 aft Xtube OD variations

Hi David,  
Please see attached FAI sheets for the 350 X-tubes that Dan put it together.  
As Dan is explaining below the last two columns named Actual Dims and variance are measurements after heat treatments.

Thanks  
Serge

-----Original Message-----

From: Dan Stow [mailto:dstow@dartaero.com]  
Sent: August 5, 2006 11:24 AM  
To: sshahbazian@dartaero.com; Bill Beckett (E-mail)  
Cc: chrisp@dartaero.com  
Subject: 350 aft Xtube OD variations

Bill/Serge,

Please review and send to David.  
Thanks Dan

Attached is a photo containing the FAI sheets for the 350 aft Xtubes  
Batches: 27827A, 27828A, 27829A, and 27830A. In the last two columns renamed Actual Dims  
and Variance from DWG Dims are the measurements that I took after they came back from  
heat treating and sand blasting. Please Note that the dimensions are not the same all  
the way around the OD of the tube, the majority of the circumferences of the tubes are  
within tolerance but there seems to be a "flat" spot in some places. Are the tubes  
acceptable?

Dan



DESIGN <i>qp</i>	DRAWN BY <i>qp</i>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
CHECKED <i>#</i>	APPROVED <i>#</i>	DRAWING NO. D350-748-241	REV. C SHEET 1 OF 3
DATE 06.08.14		TITLE CROSSTUBE (AS 350/355 HI AFT) NTS	
A	06.03.31	NEW ISSUE	
B	06.06.30	ADD D6018-125 & PRIME AND PAINT	
C	06.08.14	ADD CAD PLATING	

QTY	P/N	DESCRIPTION
X	D350-748-241	CROSSTUBE ASSEMBLY (AS 350/355 HI AFT)
1	D6018-125	CROSSTUBE (OR D6015-125)
2	D3502-1	SUPPORT
2	D2856-400-710	ABRASION STRIP
1	AELS-1032-225	INSERT
1	AN960JD10	WASHER
2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
1	MS27039-1-10	SCREW

#### **D350-748-141 CROSSTUBE:**

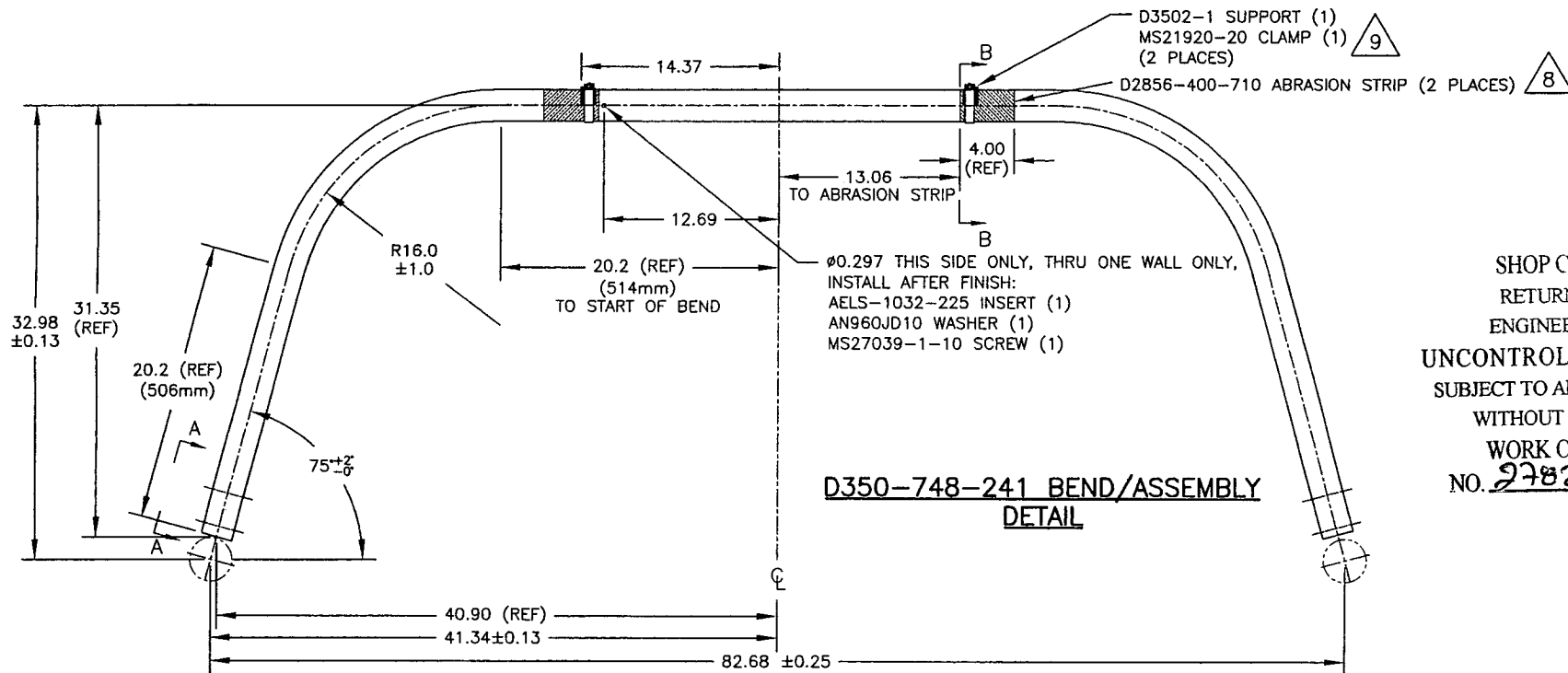
- 1) MATERIAL: MANUFACTURED FROM D6018-125 OR D6015-125  
FINISHED LENGTH = 122.70±0.06
- 2) MACHINE PER MACHINING DETAIL ON PAGE 3. BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITIONS SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 3) SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING **SHOP COPY** **STYLUS**
- 4) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D. **RETURN TO** **ENGINEERING**
- 5) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING **UNCONTROLLED COPY**
- 6) FINISH: CADMIUM PLATE PER QQ-P-416F, CLASS 1, TYPE II  
MAGNETIC PARTICLE INSPECT PER ASTM E1444 AFTER CADMIUM PLATING **SUBJECT TO AMENDMENT**  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2 **WITHOUT NOTICE**  
PAINT OUTSIDE PER DART QSI 005 4.2 **WORK ORDER**  
NO. **278274**
- 7) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- 8) INSTALL D2856-400-710 ABRASION STRIP WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 9) TORQUE MS21920-20 CLAMPS 60 TO 80 IN-LB
- 10) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 11) ALL DIMENSIONS ARE IN INCHES
- 12) PART IS SYMMETRIC ABOUT CENTERLINE EXCEPT FOR Ø0.297 HOLE.

**RELEASED**

06.08.15 *#*

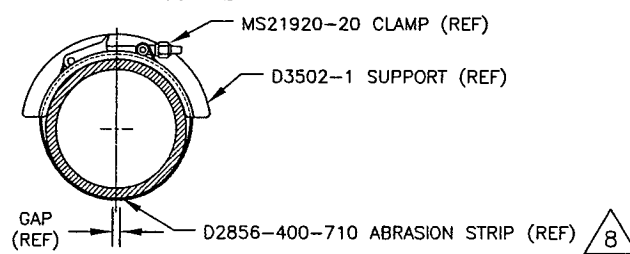
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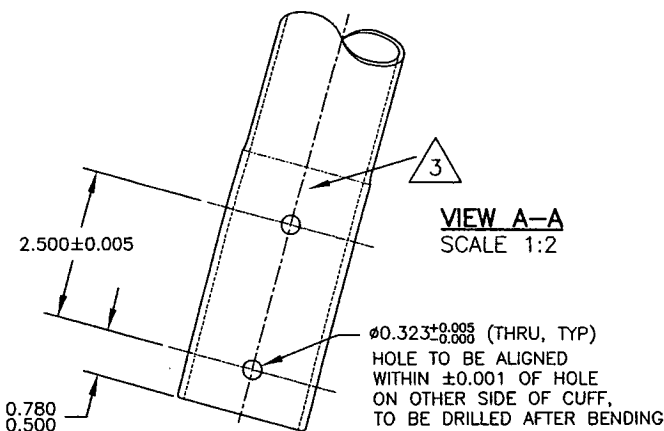
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NO. 27827

SECTION B-B  
SCALE 1:2

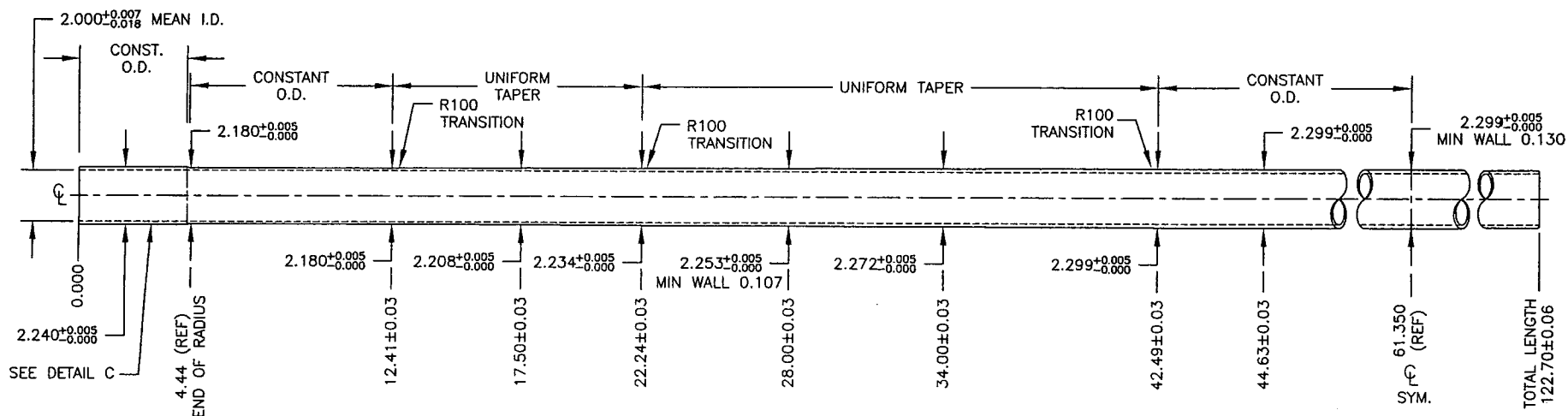


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06-08-15



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	CHECKED	APPROVED		
	DATE	DRAWING NO.		REV. C
	06.08.14	D350-748-241		SHEET 2 OF 3
		TITLE		SCALE
	CROSSTUBE (AS 350/355 HI AFT)		1:8	



RELEASED

06.08.15

# D350-748-241 MACHINING DETAIL

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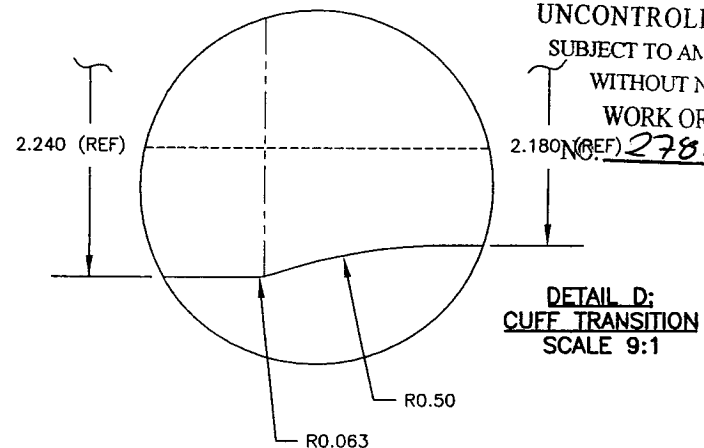
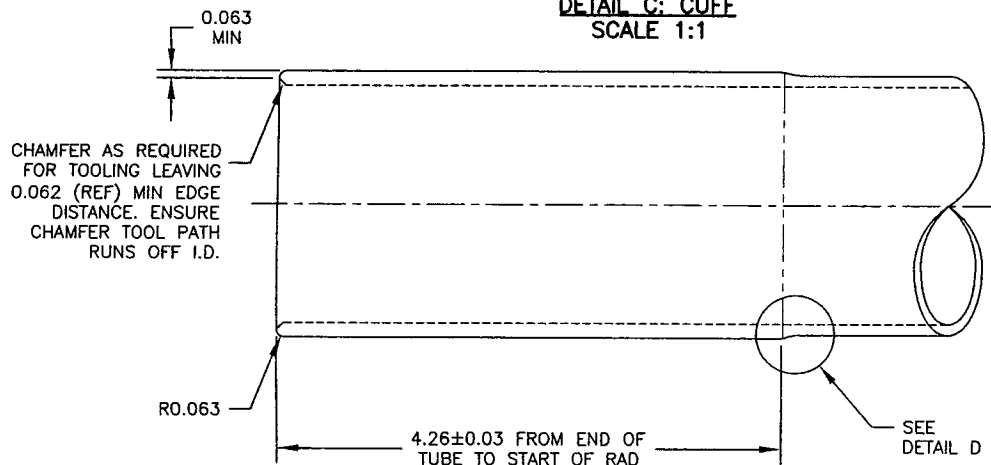
SUBJECT TO AMENDMENT

WITHOUT NOTICE

WORK ORDER

27827

## DETAIL C: CUFF SCALE 1:1



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CHECKED	APPROVED	DRAWING NO.	HAWKESBURY, ONTARIO, CANADA
DATE		D350-748-241	REV. C
06.08.14		TITLE	SHEET 3 OF 3
		CROSSTUBE (AS 350/355 HI AFT)	SCALE
			1:4

# PACKING LIST

PACKING LIST NO: 310991  
DATE: 09/22/06

DART AEROSPACE  
1270 ABERDEEN STREET  
HAWKESBURG ON K6A 1-K7

P.O. NUMBER: 274711

TERMS: C.O.D.

QUANTITY BALANCE PART NUMBER/DESCRIPTION  
SHIPPED QTY

1	0	D350-748-141	S/N: B27825A JOB: 542793
1	0	D350-748-141	S/N: B27823A JOB: 542813
1	0	D350-748-141	S/N: B27826A JOB: 542814
1	0	D350-748-241	S/N: B27830A JOB: 542815
1	0	D350-748-241	S/N: B <sup>27</sup> 2827A JOB: 542816
1	0	D350-748-241	S/N: B27828A JOB: 542817

1. Stress relieve at 350-400°F for 4 hours minimum
2. Cadmium plate per AMS-QQ-P-416B, Type II, Class 1 (QQ-P-416, Type II, Class 1)
3. Embrittlement relieve within 4 hours of plating at 350-400°F for 8 hours minimum
4. Magnetic particle inspect per ASTM E 1444-05. No linear indications/cracks allowed.

Qty Ins: 6      Qty Rej: 0      Qty Acc: 6

PACKING LIST

PACKING LIST NO: 310991  
DATE: 09/22/06

DART AEROSPACE  
1270 ABERDEEN STREET  
HAWKESBURG ON K6A 1-K7

P.O. NUMBER: 274711

TERMS: C.O.D.

QUANTITY	BALANCE	PART NUMBER/DESCRIPTION
SHIPPED	QTY	

5. Inspect

Docn No.:  
Ship Via: OTHERS

K





# SOUTHWEST

# United Industries, Inc.

422 S. ST. LOUIS / TULSA, OK 74120  
PHONE 918-587-4161 / FAX 918-582-6158  
ACCOUNTING FAX 918-585-2952

## CERTIFICATION

CERT NO: 310991  
DATE: 09/22/06

DART AEROSPACE  
1270 ABERDEEN STREET  
HAWKESBURG ON K6A 1-K7

P.O. NUMBER: 274711

P/S

### QUANTITY PART NUMBER/DESCRIPTION

1	D350-748-141	S/N: B27825A JOB: 542793
1	D350-748-141	S/N: B27823A JOB: 542813
1	D350-748-141	S/N: B27826A JOB: 542814
1	D350-748-241	S/N: B27830A JOB: 542815
1	D350-748-241	<u>27</u> S/N: B72827A JOB: 542816
1	D350-748-241	S/N: B27828A JOB: 542817

1. Stress relieve at 350-400°F for 4 hours minimum
2. Cadmium plate per AMS-QQ-P-416B, Type II, Class 1 (QQ-P-416, Type II, Class 1)
3. Embrittlement relieve within 4 hours of plating at 350-400°F for 8 hours minimum
4. Magnetic particle inspect per ASTM E 1444-05. No linear indications/cracks allowed.

Qty Ins: 6      Qty Rej: 0      Qty Acc: 6

5. Inspect

WE CERTIFY THAT THE PARTS LISTED ABOVE HAVE BEEN PROCESSED IN ACCORDANCE WITH THE REQUIREMENTS AND SPECIFICATIONS OF THE ABOVE REFERENCED PURCHASE ORDER. DOCUMENTATION IS ON FILE AND AVAILABLE FOR REVIEW



Certification

FAA Repair Station CN2R748K

Randy Bruner  
Inspector

NOTE: SUBJECT TO SOUTHWEST COMPANIES, INC. STANDARD TERMS & CONDITIONS

## INVOICE

DART AEROSPACE  
1270 ABERDEEN STREET  
HAWKESBURG ON K6A 1-K7

INVOICE NO: 310991  
DATE: 09/22/06  
SHIP DATE: 09/22/06  
P.O. NUMBER: 274711  
TERMS: C.O.D.

QUANTITY	PART NUMBER/DESCRIPTION		UNIT PRICE	AMOUNT
1	D350-748-141	S/N: B27825A JOB: 542793	1980.00	1980.00
1	D350-748-141	S/N: B27823A JOB: 542813		
1	D350-748-141	S/N: B27826A JOB: 542814		
1	D350-748-241	S/N: B27830A JOB: 542815		
1	D350-748-241	S/N: B72827A JOB: 542816		
1	D350-748-241	S/N: B27828A JOB: 542817		

1. Stress relieve at 350-400°F for 4 hours minimum
2. Cadmium plate per AMS-QQ-P-416B, Type II, Class 1 (QQ-P-416, Type II, Class 1)
3. Embrittlement relieve within 4 hours of plating at 350-400°F for 8 hours minimum
4. Magnetic particle inspect per ASTM E 1444-05. No linear indications/cracks allowed.

Qty Ins: 6      Qty Rej: 0      Qty Acc: 6

INVOICE

DART AEROSPACE  
1270 ABERDEEN STREET  
HAWKESBURG ON K6A 1-K7

INVOICE NO: 310991  
DATE: 09/22/06  
SHIP DATE: 09/22/06  
P.O. NUMBER: 274711  
TERMS: C.O.D.

QUANTITY PART NUMBER/DESCRIPTION

UNIT PRICE AMOUNT

5. Inspect

Docn No.:  
Ship Via: OTHERS

K

Total Amount 1980.00

**Chris Provencal**

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**From:** David Shepherd [dshepherd@dartaero.com]  
**Sent:** October 3, 2006 10:03 AM  
**To:** 'Chris Provencal'  
**Cc:** 'S Shahbazian'; 'Beckett, Bill'  
**Subject:** RE: 350 xtube cad plating

Chris,

I think the modified CAD plating procedure is acceptable.

As we discussed, I had some concern about the stress relieving comment on the packing slip because I didn't realize that by heating up the tubes, we would be stress relieving them. We didn't test our crosstubes in a stress relieved condition. The crosstubes we tested had compressive stresses in the tensile stress areas of the crosstube. However, because the highest stress areas are in the unbent portion of the crosstube and because I think we had so much margin in our drop test (no shock absorbers, damaged parts, overloaded, etc ...), my gut tells me that we are OK and I don't think we need to re-test.

I'm glad to hear that we are dimensionally checking the crosstubes after all the heating. I think this step should be added to the work order on receiving inspection for every crosstube.

As we discussed, I think a drawing revision is in order. I think reference to a QSI for the procedure outlined on the packing slip would be best.

David

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**From:** Chris Provencal [mailto:cprovencal@dartaero.com]  
**Sent:** Monday, October 02, 2006 2:17 PM  
**To:** David Shepherd (David Shepherd)  
**Cc:** 'S Shahbazian'; 'Bill Beckett (Bill Beckett)'  
**Subject:** 350 xtube cad plating

David,

There is another set of 350 xtubes they want to send out tomorrow. I don't know if you've had a chance to review the cad plating issue. They're eager to get a response.

To recap:

-I originally told you that the magnetic particle was done first. That was the plan, but they ended up following the drawing (cad->magnetic). The invoice I sent you gives the correct order the work was done.

-The cad plating was done to AMS-QQ-P-416B (issued 2004 by SAE) instead of the drawing's' QQ-P-416F (issued 1991 by military). I don't see a problem with this since it's a more current issue, and the only reason we specified QQ-P-416F is because that's what the "old" never-used supplier suggested.

-The dims were re-checked after cad plating and the dimensions did not change.

-An NCR has been created to address the problem with the work orders. The bigger issue is that one was sent to a customer and we need to take action on that one asap.

If you need more info, let me know.

03/10/2006

It to